

# QUALITY ASSESSMENT OF DIGITAL ELEVATION MODEL (DEM) IN VIEW OF THE ALTIPLANO HYDROLOGICAL MODELING

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**HASM** : Hydrology of the Altiplano, from Spatial to  
Modelation

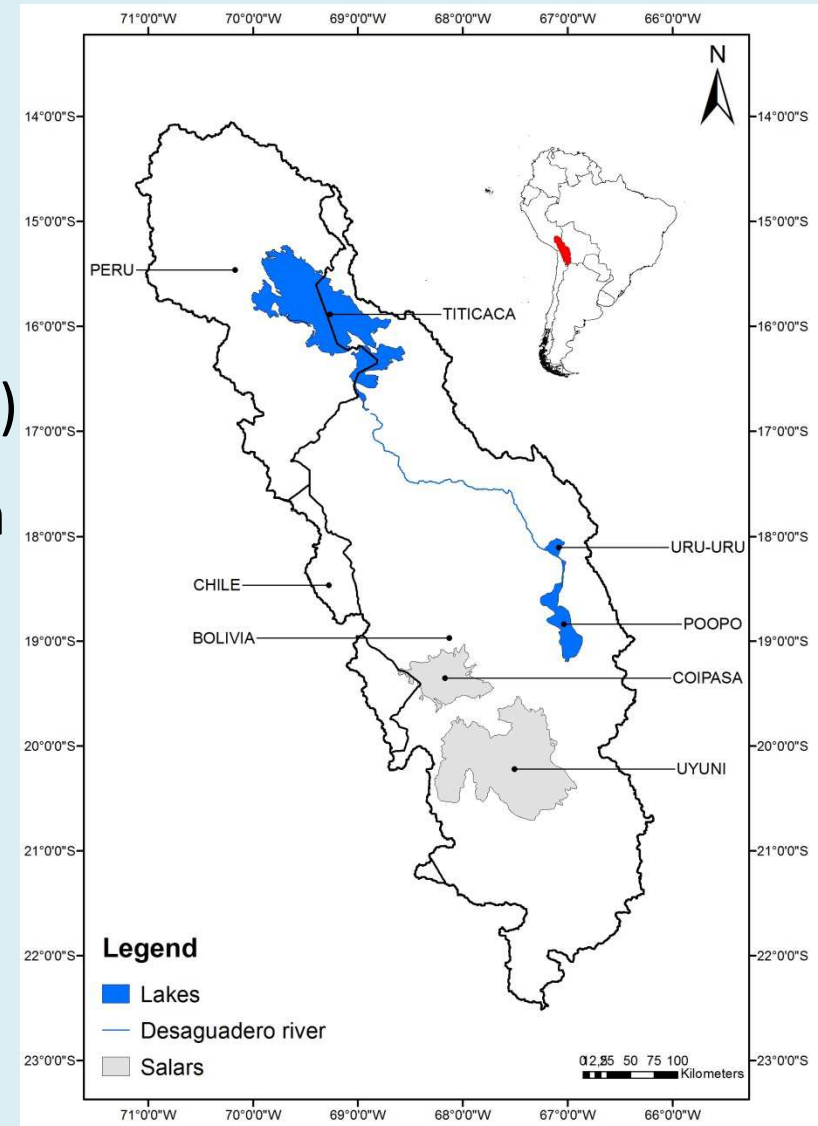


# STUDY AREA

## System TDPS

(Titicaca Desaguadero Poopó Salar)

- Endoreic watershed located between 22 and 14°S / 71 and 66°W (192 390 km<sup>2</sup>)
- Bolivia (70 %) Peru (26 %) and Chili (4 %)
- Precipitation according to a North-South Gradient (from 750 mm/year to 160 mm/year)
- Elevation range between 3600 m and 6500 m
- Including two lakes (Titicaca and Poopó) connected by the Desaguadero River and two salars (Coipasa and Uyuni)



In remote region they are often the only way to characterize topography

**Slope**  **Hydrological Network**  **Watershed delimitation**

Various DEM are available . Among them two are commonly used:

- **SRTM** (Shuttle Radar Topographic Mission)

  - Last version SRTM v4 (released in August 2008)

  - Product of NASA

  - Spatial resolution : 90 m

  - Vertical accuracy : 12.6 meters (South America)

- **GDEM** (Global Digital Elevation Model)

  - Last version GDEM v2 (released in October 2011)

  - Product of METI and NASA

  - Spatial resolution: 30 m

  - Vertical accuracy : 17 meters (World)

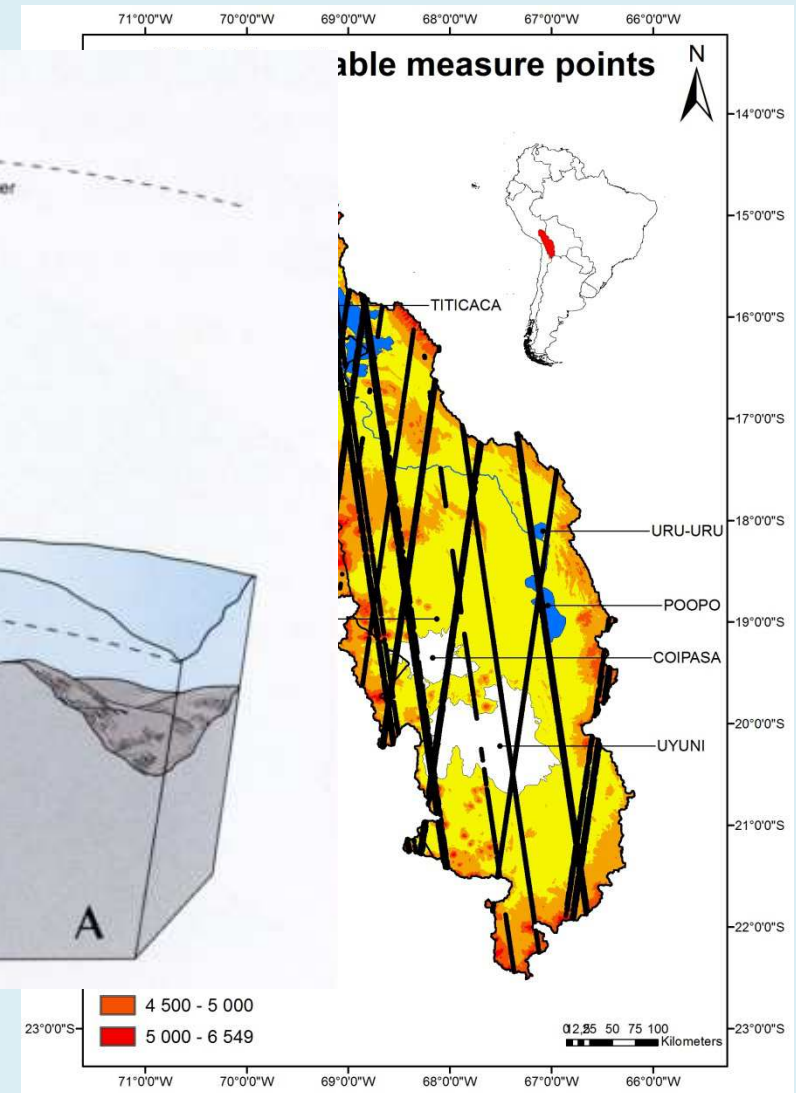
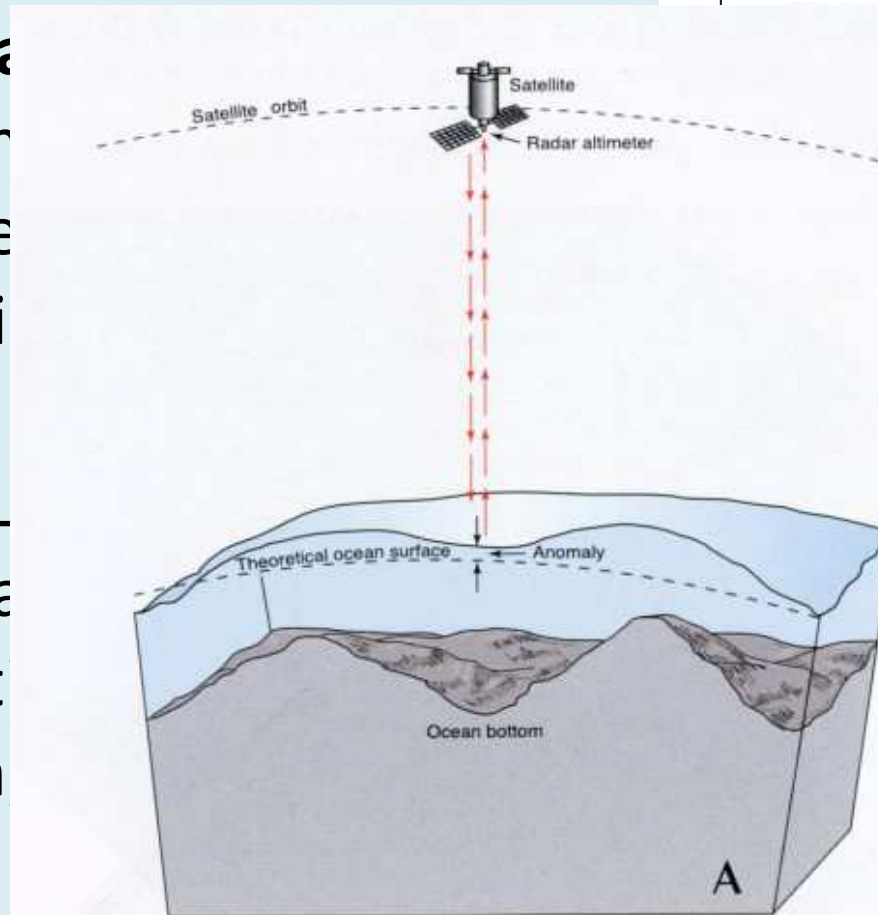
# ACCURACY ASSESSEMENT

## Need of high accuracy elevation

### measurement a

- GPS differer  
Data base  
Low spati
- **Altimetry**  
ICESat/GL  
Freely ava  
High spat  
space of 30 km  
172 m)

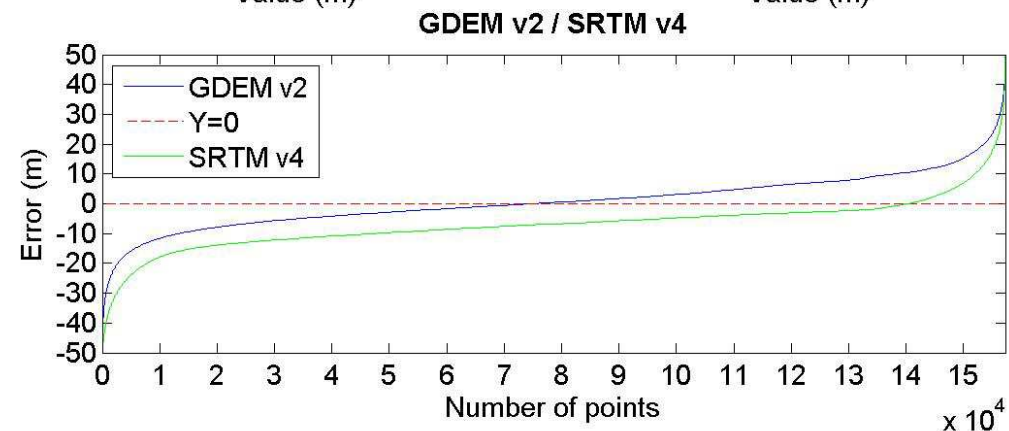
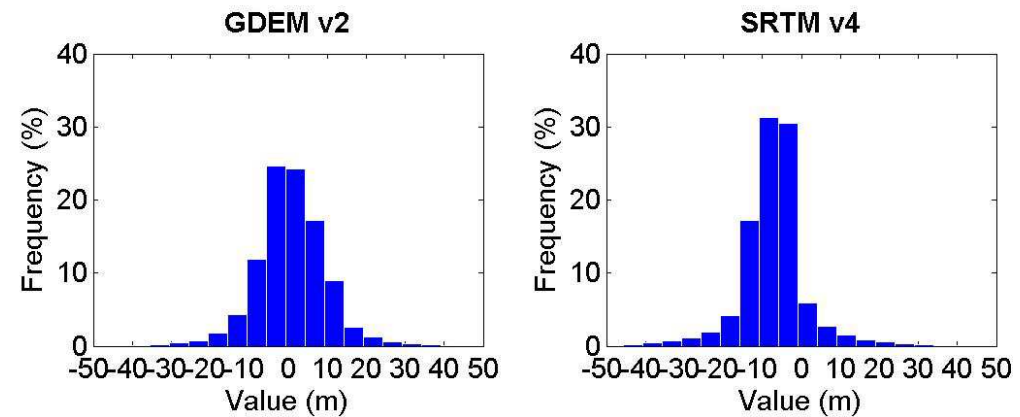
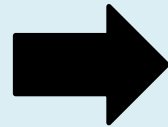
Accuracy less than 12 cm  
150 000 points available



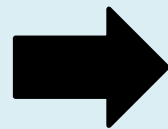
# RESULTS

## Global Scale

Negative Bias with  
SRTM v4



Better  
performance  
with GDEM v2

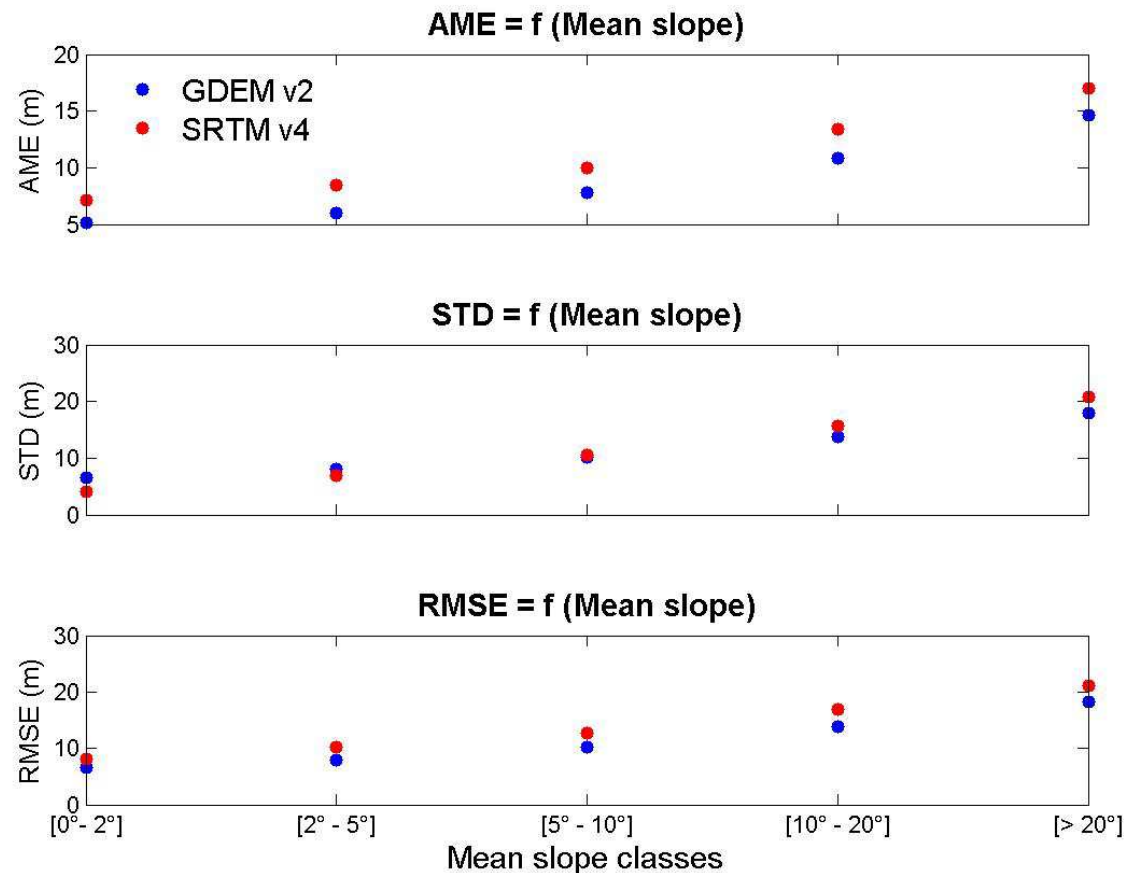
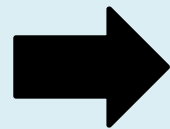


	AME	STD	RMSE
GDEM v2	6.6	9.0	9.0
SRTM v4	8.8	8.6	11.1

# RESULTS

## Mean slope classes

Increment of  
AME, STD and  
RMSE with the  
mean slope  
value

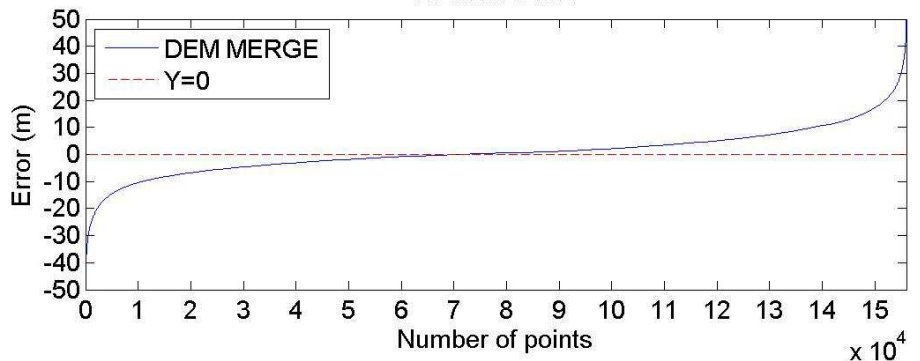
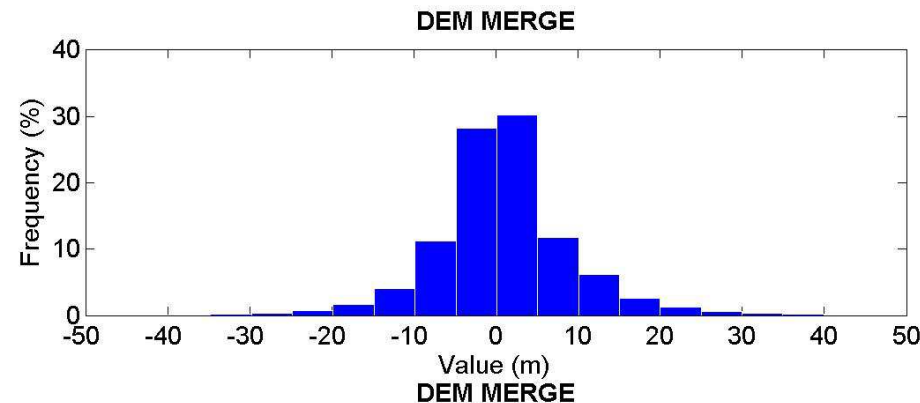


# RESULTS

## Land occupation classes

Classes	AME	STD	RMSE	RMSE		
	MERGE DEM	GDEM v2	SRTM v4	SRTM v4	GDEM v2	SRTM v4
Bare areas	5.8	8.5	8.6	6,1	7,1	8,9
Sparse vegetation	6.6	9.0	9.0	11,3	10,9	13,6
Closed to open shrubland	8.8	8.6	11.1	10,1	9,7	12,9
Mosaic Grassland/Forest				8,6	8,7	13,3
Mosaic Forest-Shrubland				10,5	10,5	13,2
Salt hardpans				5	8,2	5,3
Water bodies				8	8,8	4,1

- Low STD and bias
- Bias compensation
- Creation of corrected DEM



Results for SRTM v4

Results for SRTM v4

SRTM v4

## CONCLUSION

- **ICESat/GLAS data are useful to assess DEM in remote regions**
- **SRTM v4 showed an overall negative bias of about 8.8 m**
- **GDEM is better to reproduce the topography of the Altiplano watershed**
- **Quality DEM decreases with increasing of mean slope**
- **Correcting bias on SRTM v4 on specific area and merge it with GDEM v2 enhance the topographic scheme**



**GRACIAS**

